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Re: PCT Application No. PCT/AU03/01246

Response to 1st PCT Written Opinion and Statement of Amendment under Article 34(b)(2)

Provisional Patent Application Number 2002951632 - filed 20 September 2002, being the PCT priority document in the name of Locata Corporation, filed at IP Australia 19 September 2003. (PCT Application No. PCT/AU03/01246)

A SYSTEM AND METHOD FOR THE MITIGATION OF MULTIPATH AND THE IMPROVEMENT OF SIGNAL-TO-NOISE RATIOS IN TIME DIVISION MULTIPLE ACCESS (TDMA) LOCATION NETWORKS

This statement and request for amendment is made this 23rd Day of July 2004 under the Provisions of the Patent Cooperation Treaty Article 34 for the above application (PCT No. PCT/AU03/01246).

The requested amendments under the Provisions of the Patent Cooperation Treaty Article 34 is the withdrawal of the claims of record (claims 1 - 16), which are now herein replaced by new claims 1 – 20, which describe more accurately the invention of the present application.

Please note sheets 16 - 19 are withdrawn from the application, leaving the specification and drawings to remain as originally filed.

New sheets 16 - 19 are now herein provided.

The nature of the amendments do not in any way add to or alter the nature of the invention as originally filed.

Detailed below is the applicants response to the document cited and relied upon from the 1st PCT Written Opinion mailed 24 May 2004:

Benedicto Ruiz et al

The cited and relied upon patent Benedicto Ruiz et al. (US Pat No 5,648,748) provides a method for control of a geostationary satellite-based scanning antenna performing synchronized beam tracking of stationary ground users.

Referring now to Fig. 1 attached, there is depicted the method according to the cited and relied upon patent Benedicto Ruiz et al. A geostationary satellite 101 of known location is configured with a scanning beam antenna 102, in this illustrative example capable of aiming the beam in three sequential directions. The geostationary satellite 101 is configured to transmit and receive data packets 103 to three ground transceivers 104, 105, & 106 placed at known locations within so-called "nominal coverage zones" 107, 108, & 109. Each "nominal coverage zone" 107, 108, & 109 corresponds to a different pointing direction of the satellite-based scanning beam antenna 102. Nominal coverage zones 107, 108, & 109 must overlap so as to define a so-called "nominal synchronization zone" 110. Data synchronization packets 103 are continuously received by all three ground transceivers 104, 105, & 106 within the "nominal synchronization zone" 110, irrespective of the pointing direction of the satellite-based scanning beam antenna 102. This is required so that all three ground transceivers 104, 105, & 106 remain synchronized with the satellite data packet transmissions 103, regardless of which ground transceiver 104, 105, or 106 the geostationary satellite scanning beam antenna 102 is pointing towards.

The aim of the Benedicto Ruiz et al. invention is that, within a communications network where data synchronization is essential, a beam can be aimed at a specific ground transceiver to improve signal-to-noise ratios, yet the beam gain pattern is specifically designed so that beam overlap provides enough residual signal power within the nominal synchronization zone 110 to maintain data synchronization at the ground transceivers that are not being aimed at.

Therefore, applicant respectfully submits that Benedicto Ruiz et al. shows a system wherein:

1. The satellite-based scanning beam antenna is placed at a fixed predetermined location, and ground transceivers are placed at fixed predetermined locations; and

2. The satellite-based scanning beam antenna must provide residual signal power to all ground transceivers outside the main beam pointing direction to maintain data packet synchronization at all ground transceivers.

Applicant respectfully submits that Benedicto Ruiz el al. does not teach, show, or suggest a method for determining accurate range measurements in multipath and poor signal-to-noise ratio environments and subsequently improving location determination at a position receiver, as applicants claims now recite.

Applicant also respectfully submits that Benedicto Ruiz et al. does not teach show or suggest the calculation of location of a position receiver from received Time Division Multiple Access (TDMA) positioning signals, as applicants claims now recite.

Applicant also respectfully submits that Benedicto Ruiz et al. does not teach show or suggest the steering of a directionally agile beam antenna directional gain pattern responsive to the calculated location of a position receiver, as applicants claims now recite.

Applicant also respectfully submits that Benedicto Ruiz et al. does not teach show or suggest the steering of a directionally agile beam antenna directional gain pattern exclusively towards the origin of a currently received Time Division Multiple Access (TDMA) positioning signal, as applicants claims now recite.

Yours Sincerely

David Small
Director
Locata Corporation
23 July 2004

What is claimed is:

1. A method for determining accurate range measurements in multipath and poor signal-to-noise ratio environments and subsequently improving location determination at a position receiver incorporating a directionally agile beam antenna, said position receiver configured to receive Time Division Multiple Access (TDMA) positioning signals transmitted by a network of synchronized positioning-unit devices at known locations, the method comprising:

a) calculating the location of said position receiver from said received Time Division Multiple Access (TDMA) positioning signals, and

b) steering said directionally agile beam antenna directional gain pattern exclusively towards the origin of the currently received Time Division Multiple Access (TDMA) positioning signal, said steering responsive to:

    i) said calculated location of said position receiver, and

    ii) said known locations of said synchronized positioning-unit devices.

2. The method of claim 1, wherein said calculating the location of said position receiver from said received Time Division Multiple Access (TDMA) positioning signals additionally includes a calculation of a network time of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering is additionally responsive to said calculated network time.

3. The method of claim 1, wherein said calculating the location of said position receiver from said received Time Division Multiple Access (TDMA) positioning signals additionally includes the determination of a Time Division Multiple Access (TDMA) sequence of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering is additionally responsive to said determined Time Division Multiple Access (TDMA) sequence.

4. The method of claim 1, wherein said calculating the location of said position receiver from said received Time Division Multiple Access (TDMA) positioning signals additionally includes a calculation of the propagation delay of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering is additionally responsive to said calculated propagation delay.

5. The method of claim 1 wherein said position receiver incorporating a directionally agile beam antenna is further configured with an attitude determination means, said calculating includes an additional step of determining the attitude of said position receiver, and said steering is additionally responsive to said determined attitude.

6. A method for determining accurate range measurements in multipath and poor signal-to-noise ratio environments in a Time Division Multiple Access (TDMA) location network and subsequently improving the location determination at a position receiver, the method comprising:

a) deploying a plurality of synchronized positioning-unit devices at known locations transmitting positioning signals in a Time Division Multiple Access (TDMA) sequence;

b) deploying said position receiver configured with a directionally agile beam antenna;

c) configuring said directionally agile beam antenna to receive said positioning signals from substantially all directions;

d) calculating the location of said position receiver from said received positioning signals;

e) reconfiguring said directionally agile beam antenna to receive said positioning signals from substantially one direction;

f) steering said reconfigured said directionally agile beam antenna directional gain pattern exclusively towards the origin of the currently received positioning signal, said steering responsive to:

i) said calculated location of said position receiver, and

ii) said known locations of said synchronized positioning-unit devices.

7. The method of claim 6, wherein said calculating the location of said position receiver from said received positioning signals additionally includes a calculation of a network time of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering is additionally responsive to said calculated network time.

8. The method of claim 6, wherein said calculating the location of said position receiver from said received positioning signals additionally includes a determination of a Time Division Multiple Access (TDMA) sequence of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering is additionally responsive to said determined Time Division Multiple Access (TDMA) sequence.

9. The method of claim 6, wherein said calculating the location of said position receiver from said received positioning signals additionally includes a calculation of the propagation delay of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering is additionally responsive to said calculated propagation delay.

10. The method of claim 6, wherein said position receiver configured with a directionally agile beam antenna is further configured with an attitude determination means, said calculating includes an additional step of determining the attitude of said position receiver, and said steering is additionally responsive to said determined attitude.

11. A system for determining accurate range measurements in multipath and poor signal-to-noise ratio environments in a Time Division Multiple Access (TDMA) location network, the system comprising:

a) a plurality of synchronized positioning-unit devices at known locations transmitting positioning signals in a Time Division Multiple Access (TDMA) sequence;

b) a position receiver configured with a directionally agile beam antenna;

c) means configured to calculate the location of said position receiver from said transmitted positioning signals;

d) means configured to steer said directionally agile beam antenna directional gain pattern exclusively towards the origin of the currently received positioning signal, said steering responsive to:

i) said calculated location of said position receiver, and

ii) said known locations of said synchronized positioning-unit devices.

12. The system of claim 11, wherein said means configured to calculate the location of said position receiver additionally includes a means configured to calculate a network time of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering means is additionally responsive to said calculated network time.

13. The system of claim 11, wherein said means configured to calculate the location of said position receiver additionally includes a means configured to determine a Time Division Multiple Access (TDMA) sequence of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering means is additionally responsive to said determined Time Division Multiple Access (TDMA) sequence.

14. The system of claim 11, wherein said means configured to calculate the location of said position receiver additionally includes a means configured to calculate the propagation delay of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering means is additionally responsive to said calculated propagation delay.

15. The system of claim 11, wherein said position receiver configured with a directionally agile beam antenna is further configured with an attitude determination means, said means configured to calculate the location of said position receiver includes an additional means configured to determine the attitude of said position receiver, and said steering means is additionally responsive to said determined attitude.

16. A system for determining accurate range measurements in multipath and poor signal-to-noise ratio environments in a Time Division Multiple Access (TDMA) location network, the system comprising:

a) a plurality of synchronized positioning-unit devices at known locations transmitting positioning signals in a Time Division Multiple Access (TDMA) sequence;

b) a position receiver configured with a directionally agile beam antenna;

c) means configured to adjust said directionally agile beam antenna to receive said transmitted positioning signals from substantially all directions;

d) means configured to calculate the location of said position receiver from said transmitted positioning signals;

e) means configured to readjust said directionally agile beam antenna to receive said transmitted positioning signals from substantially one direction;

f) means configured to steer said directionally agile beam antenna directional gain pattern exclusively towards the origin of the currently received positioning signal, said steering responsive to:

i) said calculated location of said position receiver, and

ii) said known locations of said synchronized positioning-unit devices.

17. The system of claim 16, wherein said means configured to calculate the location of said position receiver additionally includes a means configured to calculate a network time of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering means is additionally responsive to said calculated network time.

18. The system of claim 16, wherein said means configured to calculate the location of said position receiver additionally includes a means configured to determine a Time Division Multiple Access (TDMA) sequence of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering means is additionally responsive to said determined Time Division Multiple Access (TDMA) sequence.

19. The system of claim 16, wherein said means configured to calculate the location of said position receiver additionally includes a means configured to calculate the propagation delay of said positioning signals transmitted by said positioning-unit devices at known locations, and said steering means is additionally responsive to said calculated propagation delay.

20. The system of claim 16, wherein said position receiver configured with a directionally agile beam antenna is further configured with an attitude determination means, said means configured to calculate the location of said position receiver includes an additional means configured to determine the attitude of said position receiver, and said steering means is additionally responsive to said determined attitude.

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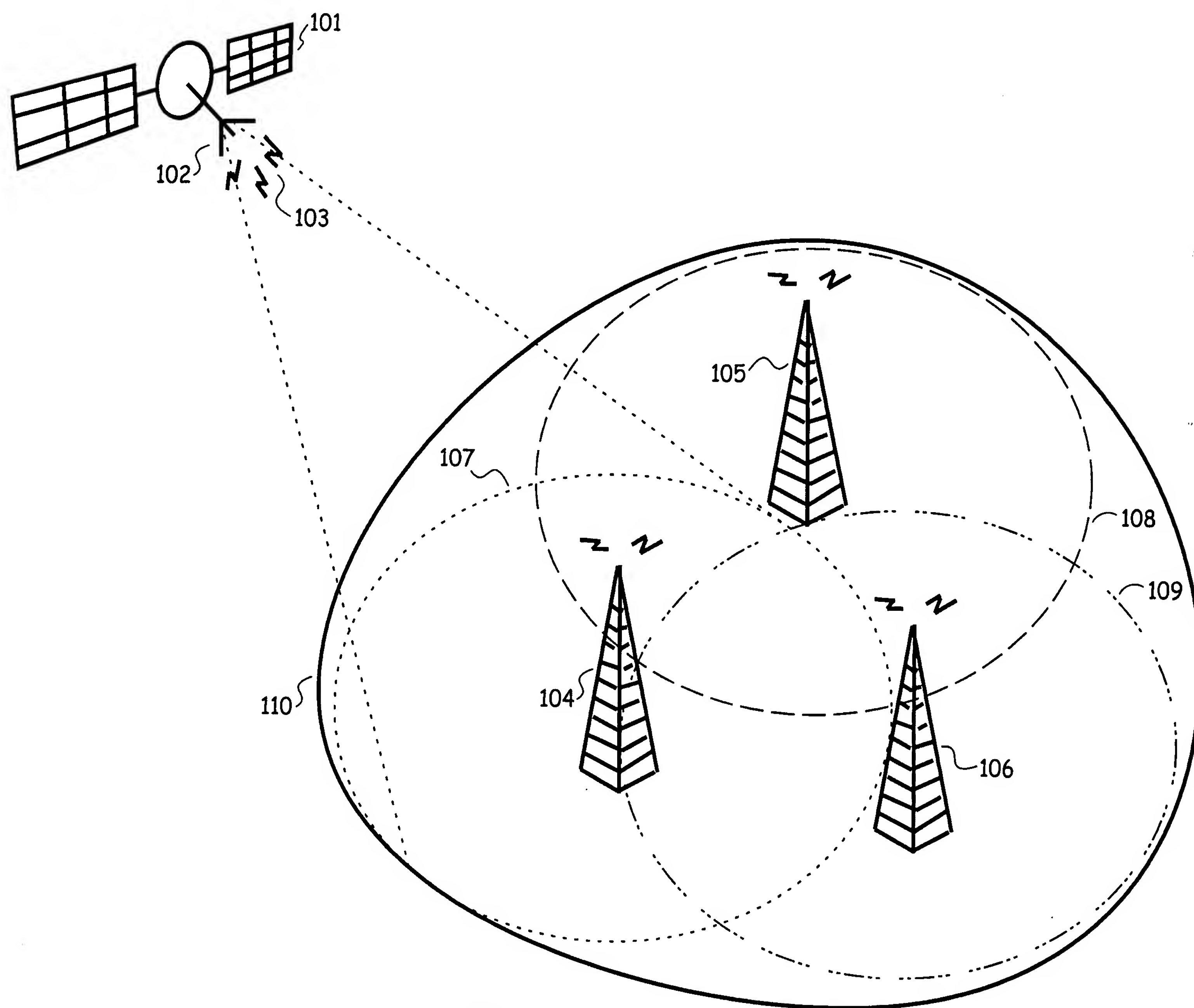

Fig. 1